

# The nyctohemeral rhythm of melatonin secretion in camel (*Camelus dromedarius*)

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## Key words

Dromedary - Melatonin - Reproduction - France.

## Summary

The melatonin, a hormone secreted by the pineal gland, was assayed in three she-camels located in the South of France. It was revealed that, like in other farm animals, there is a nyctohemeral rhythm of melatonin secretion in camel (*Camelus dromedarius*).

## ■ INTRODUCTION

The dromedary camels are seasonal breeders (3, 4). Decreasing day length stimulates seasonal reproduction. The breeding season extends from November to March in India (5), December to March in Israel (10) and November to April in most of Arabia (1). The melatonin, a hormone secreted by the pineal gland, participates in the control of the reproductive cycle both in short day breeders such as sheep (7) and goats (2) and long day breeders such as horses (6). However, to the knowledge of the authors there is no information available in the literature about the secretory pattern of melatonin in camel (*Camelus dromedarius*). The present experiment was conducted to estimate the melatonin levels in the plasma of dromedary camels during a 24 h cycle.

## ■ MATERIALS AND METHODS

### Experimental animals

Three adult female dromedary camels belonging to a private camel farm, "Les Meharées", near Montpellier in the South of France (Latitude 42° N) were used for the experiment. Blood was collected in vacutainers from the experimental animals every 2 h for 24 h. Sampling at night was done under redlight. The blood samples were collected in the month of May 1997 (May 19th and 20th), when daylight lasted 16 h. The samples were transported over 10 km to CIRAD-EMVT, Montpellier, where plasma was

separated by centrifugation at 4°C at 3000 rpm for 30 min and stored at -20°C. The samples were then transported in dry ice to PRMD-INRA, centre de Tours, Nouzilly, where assay for melatonin was carried out.

### Melatonin assay

The melatonin plasma concentration was measured by adapting a specific radioimmunoassay technique previously described in sheep (8). Briefly, to 100 µl of plasma were added 100 µl of antimelatonin antibody (final dilution 1/400,000) and 300 µl of iodinated melatonin in tricine buffer (15,000 cp/min). After an incubation of 18 h at 4°C, 1 ml of an anti-rabbit γ-globulin (raised in sheep) was added for 1 h. After centrifugation, the supernatant was discarded and the pellet counted on a γ-counter. A standard-curve (5-500 pg melatonin/ml) was prepared using low melatonin camel plasma obtained in the middle of the afternoon or in a plasma treated with charcoal in order to remove melatonin. Serial dilutions of night plasma were tested against a standard curve in daytime camel plasma to test the parallelism between dilution and standard-curve. The cross-reactivity of this antibody with related compounds was < 1% for N-acetylserotonin and 6-hydroxy-melatonin and totally absent for other compounds tested (9). The concentrations were calculated by logit curves (figure 1). All plasma samples from the three camels were analyzed in the same assay.

## ■ RESULTS AND DISCUSSION

Figure 1 reports a standard-curve obtained with daytime camel plasma. There is no difference with a standard curve obtained with camel plasma treated with charcoal (data not shown). The parallelism between a standard-curve and serial dilutions of plasma was good. The sensitivity of the assay was 5 pg melatonin/ml plasma.

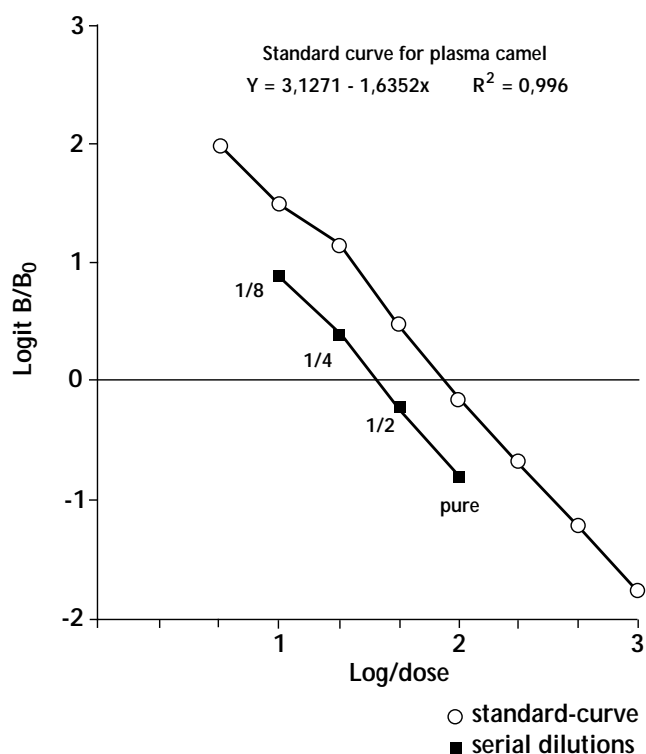
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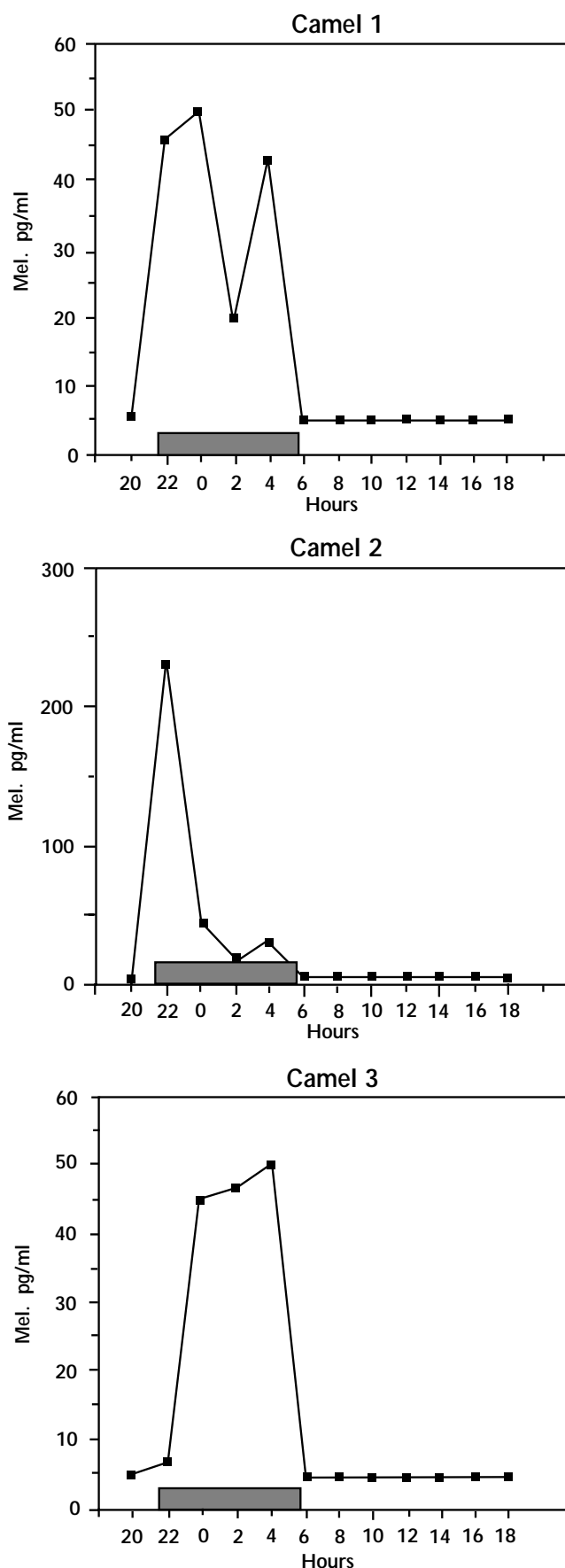
**Figure 1:** standard-curve for plasma camel (○) and serial dilutions of plasma camel (■).

The melatonin levels in all three camels were very low (5 pg/ml) during the period of light (photophase) and increased only in period of darkness. The plasma concentration in two camels reached a peak (233 pg/ml in camel 2) or near peak levels (46 pg/ml in camel 1) within 15 min of darkness, whereas the increase in melatonin concentration was gradual in camel 3 (figure 2). Peak levels in the three camels were 50, 233 and 50 pg/ml, respectively. The plasma concentration of melatonin declined to 5 pg/ml with sunrise in all three camels.

The present experiment revealed that, like in other farm animals, secretion of melatonin by the pineal gland also follows a nyctohemeral pattern (8). There are individual variations in the concentration of melatonin, but it seems that melatonin concentrations are lower than in sheep (8). Secretion of melatonin occurs throughout the night as in sheep. Further experiments are required to study the secretory pattern and levels of melatonin in camels in different seasons of the year and under controlled lighting, and to use photo periodic control and its simulation by melatonin administration to enhance and/or extend calving intervals in dromedary camels from 3-4 to 1.5-2 years.

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**Figure 2:** nyctohemeral patterns of melatonin in plasma camel. Solid bars indicate periods of darkness.

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**Résumé**

**Vyas S., Ravault J.P., Faye B., Chemineau P.** Rythme nycthé-méral de la sécrétion de mélatonine chez le dromadaire (*Camelus dromedarius*)

La mélatonine, une hormone sécrétée par la glande pinéale, a été dosée sur trois chamelles vivant dans le Sud de la France. Comme pour les autres espèces domestiques, les résultats montrent qu'il existe un rythme nycthé-méral de la sécrétion de cette hormone chez le dromadaire (*Camelus dromedarius*).

**Mots-clés** : Dromadaire - Mélatonine - Reproduction - France.

**Resumen**

**Vyas S., Ravault J.P., Faye B., Chemineau P.** Ritmo nictermeral de la secreción de melatonina en el camello (*Camelus dromedarius*)

Se administró melatonina, hormona secretada por la glándula pineal, a tres hembras camellos en el Sur de Francia. Al igual que para otras especies domésticas, los resultados demuestran la existencia de un ritmo nictermeral de la secreción de esta hormona en el dromedario (*Camelus dromedarius*).

**Palabras clave**: Dromedario - Melatonina - Reproducción - Francia.